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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE MATTER OF THE PATENT APPLICATION

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USSN: TO BE ASSIGNED - NEW

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FOR: WOOD GOLF CLUB HEAD DESIGNED TO DESCRIBE THE OPTIMUM  
TRAJECTORY OF A GOLF BALL

MS PATENT APPLICATION  
COMMISSIONER FOR PATENTS  
P.O. BOX 1450  
ALEXANDRIA, VA 22313-1450

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SECOND VOLUNTARY AMENDMENT

Dear Sir:

After granting a filing date and calculating the filing fee for this new patent application, but before the first examination, please amend the application as follows.

In the Claims:

Claims 1 to 3 are maintained unchanged.

Claims 4 to 12 have been cancelled in the First Preliminary Amendment filed simultaneously herewith and with this new patent application.

Please enter new claims 13 to 29 as follows.

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13. (new) The wood golf club head according to claim 1, wherein said ellipse is determined by solving the equation of motion using the following equations:

$$F_x(t) = -\frac{1}{2}(C_D(t)\cos \alpha + C_L(t)\sin \alpha) \rho AV_B(t)^2$$

$$F_y(t) = -\frac{1}{2}(C_D(t)\sin \alpha - C_L(t)\cos \alpha) \rho AV_B(t)^2 - mg$$

$$N(t+\Delta t) = -\rho AdC_m(t)V_B(t)^2 \Delta t / (4\pi I) + N(t)$$

wherein  $F_x(t)$  is force applied to a ball in flight in the flight direction at time instant  $t$ ,  $F_y(t)$  is force applied to a ball in flight in the vertical direction at time instant  $t$ , and  $N(t+\Delta t)$  is decrease in the rotational speed of a ball due to aerodynamic torque after interval of  $\Delta t$ ; and

wherein  $C_D$ : drag coefficient,  $C_L$ : lift coefficient,  $\alpha$ : elevation angle of a ball(deg),  $\rho$ : air density(kg/m<sup>3</sup>),  $A$ : ball sectional area(m<sup>2</sup>),  $V_B$ : ball velocity(m/sec),  $m$ : ball mass(kg),  $g$ : gravitational acceleration(m/sec<sup>2</sup>),  $C_m$ : moment coefficient,  $d$ : ball diameter(m),  $I$ : moment of inertia of a ball (kg/m<sup>2</sup>),  $N$ : ball rotational speed(rps).

14. (new) The wood golf club head according to claim 2, wherein said ellipse is determined by solving the equation of motion using the following equations:

$$F_x(t) = -\frac{1}{2}(C_D(t)\cos \alpha + C_L(t)\sin \alpha) \rho AV_B(t)^2$$

$$F_y(t) = -\frac{1}{2}(C_D(t)\sin \alpha - C_L(t)\cos \alpha) \rho AV_B(t)^2 - mg$$

$$N(t+\Delta t) = -\rho AdC_m(t)V_B(t)^2 \Delta t / (4\pi I) + N(t)$$

wherein  $F_x(t)$  is force applied to a ball in flight in the flight direction at time instant  $t$ ,  $F_y(t)$  is force applied to a ball in flight in the vertical direction at time instant  $t$ , and  $N(t+\Delta t)$  is decrease in the rotational

speed of a ball due to aerodynamic torque after interval of  $\Delta t$ ; and

wherein  $C_D$ : drag coefficient,  $C_L$ : lift coefficient,  $\alpha$ : elevation angle of a ball(deg),  $\rho$ : air density(kg/m<sup>3</sup>),  $A$ : ball sectional area(m<sup>2</sup>),  $V_B$ : ball velocity(m/sec),  $m$ : ball mass(kg),  $g$ : gravitational acceleration(m/sec<sup>2</sup>),  $C_m$ : moment coefficient,  $d$ : ball diameter(m),  $I$ : moment of inertia of a ball (kg m<sup>2</sup>),  $N$ : ball rotational speed(rps).

15. (new) The wood golf club head according to claim 3, wherein said ellipse is determined by solving the equation of motion using the following equations:

$$F_X(t) = -\frac{1}{2}(C_D(t)\cos \alpha + C_L(t)\sin \alpha) \rho A V_B(t)^2$$

$$F_Y(t) = -\frac{1}{2}(C_D(t)\sin \alpha - C_L(t)\cos \alpha) \rho A V_B(t)^2 - mg$$

$$N(t+\Delta t) = - \rho A d C_m(t) V_B(t)^2 \Delta t / (4\pi I) + N(t)$$

wherein  $F_X(t)$  is force applied to a ball in flight in the flight direction at time instant  $t$ ,  $F_Y(t)$  is force applied to a ball in flight in the vertical direction at time instant  $t$ , and  $N(t+\Delta t)$  is decrease in the rotational speed of a ball due to aerodynamic torque after interval of  $\Delta t$ ; and

wherein  $C_D$ : drag coefficient,  $C_L$ : lift coefficient,  $\alpha$ : elevation angle of a ball(deg),  $\rho$ : air density(kg/m<sup>3</sup>),  $A$ : ball sectional area(m<sup>2</sup>),  $V_B$ : ball velocity(m/sec),  $m$ : ball mass(kg),  $g$ : gravitational acceleration(m/sec<sup>2</sup>),  $C_m$ : moment coefficient,  $d$ : ball diameter(m),  $I$ : moment of inertia of a ball (kg m<sup>2</sup>),  $N$ : ball rotational speed(rps).

- 1     **16.**   (new) The wood golf club head according to claim 1, wherein  
2           a face of said wood golf club head is formed of a low  
3           friction material.
- 1     **17.**   (new) The wood golf club head according to claim 2, wherein  
2           a face of said wood golf club head is formed of a low  
3           friction material.
- 1     **18.**   (new) The wood golf club head according to claim 3, wherein  
2           a face of said wood golf club head is formed of a low  
3           friction material.
- 1     **19.**   (new) The wood golf club head according to claim 16,  
2           wherein said face is coated with DLC (Diamond-like carbon),  
3           ceramic, or SiC.
- 1     **20.**   (new) The wood golf club head according to claim 16,  
2           wherein said face is composed of DYNEEMA® FRP.
- 1     **21.**   (new) The wood golf club head according to claim 16,  
2           wherein said face is plated with chromium or dispersed  
3           nickel.
- 1     **22.**   (new) The wood golf club head according to claim 16,  
2           wherein said face has an insert formed of polyacetal,  
3           polyamide, polytetrafluoroethylene, polyphenylenesulfide,  
4           polyamideimide, or polyimide.

1     **23.**   (new) The wood golf club head according to claim 1, wherein  
2           said face is formed of composite materials that are made  
3           from pitch-based carbon fibers and a pitch-based matrix.

1     **24.**   (new) The wood golf club head according to claim 1, wherein  
2           said wood golf club head is a driver club head.

1     **25.**   (new) The wood golf club head according to claim 1, wherein  
2           said wood golf club head is a driver club head, and its  
3           loft is 13 to 20 degrees.

1     **26.**   (new) The wood golf club head according to claim 2, wherein  
2           said face is formed of composite materials that are made  
3           from pitch-based carbon fibers and a pitch-based matrix.

1     **27.**   (new) The wood golf club head according to claim 3, wherein  
2           said face is formed of composite materials that are made  
3           from pitch-based carbon fibers and a pitch-based matrix.

1     **28.**   (new) The wood golf club head according to claim 2, wherein  
2           said wood golf club head is a driver club head, and its  
3           loft is 13 to 20 degrees.

1     **29.**   (new) The wood golf club head according to claim 3, wherein  
2           said wood golf club head is a driver club head, and its  
3           loft is 13 to 20 degrees.

**[AMENDMENT CONTINUES ON NEXT PAGE]**